

# ASTRONOMY AND ASTROPHYSICS

**A European Journal**

**Volume 231 1990**

**Published by Springer International on behalf of the Board of Directors**

# Astronomy and Astrophysics A European Journal

## Board of Directors

Chairman: G. Contopoulos  
(Greece)

Vice Chairman: G. Setti  
(Italy)

D. Alloin  
(France)

R. Canal  
(Spain)

H. Haupt  
(Austria)

A. G. Hearn  
(The Netherlands)

A. Maeder  
(Switzerland)

K. Mattila  
(Finland)

P. G. Mezger  
(Germany, Federal Republic)

P. E. Nissen  
(Denmark)

Aa. Sandqvist  
(Sweden)

E. Schatzman  
(France)

E. H. Schröter  
(Germany, Federal Republic)

P. Smeyers  
(Belgium)

H. van der Laan  
(ESO)

## Editors-in-Chief

J. Lequeux  
Astronomy and Astrophysics  
Editorial Office  
Observatoire de Meudon  
92 195 Meudon Principal Cedex  
(France)  
Tel. (31-1) 45-07-06-30  
Telex (42) 270912 obsastr  
Telefax (33-1) 46266293

E-Mail:  
EARN AANDA @ FRMEU 51  
SPAN MESIOA::AANDA

M. Grewing  
Astronomy and Astrophysics  
Editorial Office  
c/o Astronomisches Institut  
Waldhäuserstrasse 64  
7400 Tübingen  
(Fed. Rep. of Germany)  
Tel. (49-70 71) 2949 82  
Telefax (49-0 70 71) 29 34 58  
Telex (41) 7262 714 ait d  
E-Mail:  
DatexP 0262-45707130039  
SPAN AITMVX::AAPTUE

## Letter-Editor

S. R. Pottasch  
Kapteyn Astronomical Institute  
P. O. Box 800  
9700 AV Groningen  
(The Netherlands)  
Tel. (31-50) 63 40 93  
Telex (44) 53 572 stars nl  
Telefax (31-50) 63 40 33

## Editing Secretaries

Miss B. Perche  
Mrs. M. Rougeot

Mrs. U. Hilkes

Mrs. B. J. Boersma-Reed

The exclusive copyright © for all languages and countries, including the right for photomechanical and any other reproduction, also in microform, is vested in European Southern Observatory (ESO).

The use of registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

Springer International 1990  
Printed in Germany  
Printer: Saladruck Steinkopf & Sohn, Berlin  
Bookbinder: Lüderitz & Bauer, Berlin

# Contents

## Letters to the Editor

- Accretion disk in the high-redshift quasar HS 1700 + 6416  
*Siemiginowska, A., Dobrzycki, A.* L1
- Deceleration of interstellar hydrogen at heliopause crossing suggested by Lyman-alpha spectral observations  
*Lallement, R., Bertaux, J.L.* L3
- Gamma-ray emission from pulsars and Hardee mechanism of  $e^+e^-$ -production  
*Tan Lu, Tianyi Shi* L7
- We21: a WN8 star in a planetary nebula  
*Duerbeck, H.W., Reipurth, B.* L11
- Detection of 183 GHz water vapour maser emission from interstellar and circumstellar sources  
*Cernicharo, J., Thum, C., Hein, H., John, D., Garcia, P., Mattioco, F.* L15
- NTT images of ultraluminous infrared galaxies  
*Melnick, J., Mirabel, I.F.* L19
- Low-energy cosmic  $\gamma$  rays from cosmological photino annihilation  
*Cline, D.B., Yi-Tian Gao* L23
- Supernova rates and bursts of star formation  
*van den Bergh, S.* L27
- The vertical distribution of carbon monoxide on Mars from the ISM-Phobos experiment  
*Rosenqvist, J., Bibring, J.-P., Combes, M., Drossart, P., Encrenaz, T., Erard, S., Forni, O., Gondet, B., Langevin, Y., Lellouch, E., Masson, P., Soufflot, A.* L29
- Spectroscopic investigation of old planetaries. I. Detection of two new "PG 1159" central stars  
*Schönberner, D., Napiwotzki, R.* L33

## Cosmology

- Jeans mass of a cosmological coherent scalar field  
*Bianchi, M., Grasso, D., Ruffini, R.* 301

## Extragalactic astronomy

- The local anomaly of the extragalactic velocity field  
*Giraud, E.* 1
- An interacting galaxy in the Klemola 11 group  
*Danks, A.C.* 13

- Realistic elliptical potentials wells for gravitational lens models  
*Schramm, T.* 19
- Observations of CO emission from the nucleus of NGC 4945  
*Whiteoak, J.B., Dahlem, M., Wielebinski, R., Harnett, J.I.* 25
- Mg II quasar absorption systems and properties of gaseous haloes  
*Petitjean, P., Bergeron, J.* 309
- 3C 338 and the evolution of radio galaxies in clusters  
*Roland, J., Hanisch, R.J., Pelletier, G.* 327
- On the nature of compact steep spectrum radio sources  
*Fanti, R., Fanti, C., Schilizzi, R.T., Spencer, R.E., Nan Rendong, Parma, P., van Breugel, W.J.M., Venturi, T.* 333

## Galactic structure and dynamics

- Generalized Riemann configurations and Dedekind's theorem: the case of non-linear internal velocities  
*Filippi, S., Ruffini, R., Sepulveda, A.* 30
- Asymptotic curves and escapes in Hamiltonian systems  
*Contopoulos, G.* 41
- Swing amplification of spiral waves in low-mass discs  
*Pellat, R., Tagger, M., Sygnet, J.F.* 347

## Formation, structure and evolution of stars

- Multiple frequencies of the  $\delta$  Scuti variable 4 Canum Venaticorum  
*Breger, M., McNamara, B.J., Kerschbaum, F., Huang Lin, Jiang Shi-yang, Guo Zi-He, Poretti, E.* 56
- Disk evolution caused by gravitational radiation reaction  
*Eriguchi, Y., Futamase, T., Hachisu, I.* 61
- (RN) RAFGL 2233 and RAFGL 2901: supergiant carbon stars?  
*Claussen, M.J., Ziurys, L.M.* 73
- Spectroscopic fine-structure in Supernova 1987 A  
*Hanuschik, R.W., Thimm, G.J.* 77
- An analytical approach to the problem of mass loss from Wolf-Rayet stars  
*Bandiera, R., Turolla, R.* 85
- Absolute dimensions of early-type eclipsing binary stars. I. NY Cephei  
*Holmgren, D.E., Hill, G., Fisher, W., Scarfe, C.D.* 89

(RN) Constraints to the mass loss rate of globular cluster red giants <i>Paez, E., Martinez Roger, C., Manteiga, M., Arribas, S.</i>	95	A radio survey of IRAS-selected Be stars <i>Taylor, A.R., Waters, L.B.F.M., Bjorkman, K.S., Dougherty, S.M.</i>	453
(RN) The possible biperiodicity of WR 40 <i>Gosset, E., Vreux, J.-M.</i>	100	Hydrogen atomic model effects in the NLTE modelling of dMe chromospheres <i>Houdebine, E.R., Panagi, P.M.</i>	459
BD +37°1160: a probable optical counterpart of the X-ray source 1H0521+373 <i>Polcaro, V.F., Rossi, C., Giovannelli, F., Ferrari-Toniolo, M., La Padula, C., Persi, P., Manchanda, R.K., Golinnskaya, I.M., Kurt, V.G., Misykima, T.A., Shafer, E. Yu., Shamolin, V.M., Smirnov, A.S., Sheffer, E.K., Boyarchuck, A.A., Gershberg, R.</i>	354	<b>Diffuse matter in space (including HII regions and planetary nebulae)</b>	
Simultaneous analysis of light and radial velocity curves of the peculiar contact system V 508 Ophiuchi <i>Lapasset, E., Gómez, M.</i>	365	A CO survey of the dark clouds in Ophiuchus <i>de Geus, E.J., Bronfman, L., Thaddeus, P.</i>	137
The active eclipsing binary RS Canum Venaticorum <i>Reglero, V., Giménez, A., Estela, A.</i>	375	Sulphur-bearing molecules in dark clouds <i>Fuente, A., Cernicharo, J., Barcia, A., Gómez-González, J.</i>	151
Detection of acoustic oscillations in the F2V star HD 155543 <i>Belmonte, J.A., Pérez Hernández, F., Roca Cortés, T.</i>	383	The detection of rotationally excited $^2\pi_{1/2}$ , $J=3/2$ and $J=5/2$ main lines of OH <i>Wilson, T.L., Walmsley, C.M., Baudry, A.</i>	159
Bimodality versus multimodality: Do fragmentation theories support a bimodal IMF? <i>Ferrini, F., Palla, F., Penco, U.</i>	391	Multiple star formation in the Bok globule L 810 <i>Neckel, T., Staude, H.J.</i>	165
Far evolved AGB stars in the galactic bulge <i>van der Veen, W.E.C.J., Habing, H.J.</i>	404	High-velocity molecular bullets in a fast bipolar outflow near L 1448/IRS 3 <i>Bachiller, R., Cernicharo, J., Martin-Pintado, J., Tafalla, M., Lazareff, B.</i>	174
The low mass protostellar candidate NGC 1333/IRAS-1 <i>Knee, L.B.G., Cameron, M., Liseau, R.</i>	419	Observations of the diffuse near-UV radiation field <i>Murthy, J., Henry, R.C., Feldman, P.D., Tennyson, P.D.</i>	187
<b>Stellar atmospheres</b>		(RN) Statistics of refractive pulsar scintillation: effect of limited data length <i>Deshpande, A.A., Nityananda, R.</i>	199
Amorphous carbon grains and emission spectra of IRC+10216 <i>Orofino, V., Colangeli, L., Bussoletti, E., Blanco, A., Fonti, S.</i>	105	Organo-sulphur chemistry in dense interstellar clouds <i>Millar, T.J., Herbst, E.</i>	466
Line blanketing, and the computation of line equivalent widths in the comoving frame <i>Hillier, D.J.</i>	111	Molecules and masers near compact HII regions <i>Forster, J.R., Caswell, J.L., Okumura, S.K., Hasegawa, T., Ishiguro, M.</i>	473
An iterative method for the solution of the statistical and radiative equilibrium equations in expanding atmospheres <i>Hillier, D.J.</i>	116	Shock wave interactions with interstellar clouds <i>Bedogni, R., Woodward, P.R.</i>	481
The wings of the calcium infrared triplet lines in late-type giant stars <i>Smith, G., Drake, J.J.</i>	125	Populations of the OI metastable levels <i>Péquignot, D.</i>	499
An X-ray flare observed from van Biesbroeck 8 <i>Tagliaferri, G., Doyle, J.G., Giommi, P.</i>	131	<b>The Sun</b>	
(RN) Parametrization of stellar rates of mass loss as functions of the fundamental stellar parameters $M$ , $L$ , and $R$ <i>Nieuwenhuijzen, H., de Jager, C.</i>	134	Time profiles of solar radio spikes <i>Güdel, M., Benz, A.O.</i>	202
SiO masers in giant semi-regular variables and supergiants <i>Alcolea, J., Bujarrabal, V., Gómez-González, J.</i>	431	Extended massive current sheet in a two-dimensional constant- $\alpha$ force-free field: a model for quiescent prominences. I. Theory <i>Amari, T., Aly, J.J.</i>	213
Astrophysical oscillator strengths for TiO and VO bands from spectrum synthesis of spectral types M1 III to M7 III <i>Brett, J.M.</i>	440	Solar line asymmetries and the magnetic filling factor <i>Brandt, P.N., Solanki, S.K.</i>	231
		Non-adiabatic modelling of "5-min" oscillations: effects on photospheric line profiles <i>Bertello, L., Caccin, B.</i>	509
		Depth dependence of the intensity-velocity phase difference in the solar "5-min" oscillations <i>Alamanni, N., Bertello, L., Cavallini, F., Ceppatelli, G., Righini, A.</i>	518
		Solar flare plasma properties derived from the disk-integrating GOES X-ray sensors during an eclipse <i>Bornmann, P.L., Matheson, L.D.</i>	525

FeII transition probabilities and the solar iron abundance <i>Pauls, U., Grevesse, N., Huber, M.C.E.</i>	536	Overstable slow-gravity modes in a thermally conducting MHD plasma-slab <i>Hermans, D., Goossens, M., Kerner, W.</i>	259
<b>The solar system</b>		Analytical studies of collimated winds. I. Topologies of 2- D helicoidal hydrodynamic solutions <i>Tsinganos, K., Trussoni, E.</i>	270
Spectro-imagery of P/Halley's inner coma in the OH and NH ultraviolet bands <i>Clairemidi, J., Moreels, G., Krasnopolsky, V.A.</i>	235	Determination of the radiative properties of the $5s\,5p\,^3P_1$ and the $5s\,6s\,^3S_1$ levels in cadmium <i>van der Veer, W.E., van der Blonk, D.P., Dönszelmann, A.</i>	277
The possible role of organic polymers in the structure and fragmentation of dust in the coma of comet P/Halley <i>Boehnhardt, H., Fechtig, H., Vanysek, V.</i>	543	Formation of condensations in young stellar outflows by a thermal instability <i>de Gouveia Dal Pino, E.M., Opher, R.</i>	571
An analysis of the amplitude-phase relationship among as- teroids <i>Zappalà, V., Cellino, A., Barucci, A.M., Fulchignoni, M., Lupishko, D.F.</i>	548	<b>Instruments, data processing, and computational methods</b>	
<b>Celestial mechanics and astrometry</b>		A rapidly converging temperature correction procedure us- ing operator perturbation <i>Steiner, O.</i>	278
The orbits of the satellites of Neptune <i>Jacobson, R.A.</i>	241	Two-dimensional stellar radiative transfer resulting from a core eccentricity <i>Bouquet, S., Tortel, B., Burgan, J.R.</i>	289
Iterative method in the construction of a general planetary theory (Text in French) <i>Bretagnon, P.</i>	561	A method to enhance the cross correlation of millisecond- pulsar VLBI data: observations of PSR 1937+214 <i>Petit, G., Fayard, T., Lestrade, J.-F.</i>	581
<b>Physical and chemical processes</b>		(RN) A note on stellar ultraviolet linear polarization obser- vations <i>Huovelin, J., Pirola, V.</i>	588
Particle acceleration by an ensemble of shocks <i>Achterberg, A.</i>	251		